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Standard Specification for Nonferrous Nuts for General Use [Metric][1]

This standard is issued under the fixed designation F 467M; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope*

1.1 This specification covers the requirements for commercial wrought nonferrous nuts in nominal thread diameters M6 to M36 inclusive in a number of alloys in common use and intended for general service applications.

1.2 Applicable bolts, cap screws, and studs for use with nuts covered by this specification are covered by Specification F 468M.

NOTE 1—This specification is the metric companion of Specification F 467.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

B 154 Test Method for Mercurous Nitrate Test for Copper Alloys
B 574 Specification for Low-Carbon Nickel-Chromium-Molybdenum, Low-Carbon Nickel-Molybdenum-Chromium-Tantalum, Low-Carbon Nickel-Chromium-Molybdenum-Copper, and Low-Carbon Nickel-Chromium-Molybdenum-Tungsten Alloy Rod
D 3951 Practice for Commercial Packaging
E 18 Test Methods for Rockwell Hardness of Metallic Materials
E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications
E 34 Test Methods for Chemical Analysis of Aluminum and Aluminum-Base Alloys
E 38 Methods for Chemical Analysis of Nickel-Chromium and Nickel-Chromium-Iron Alloys[3]
E 53 Test Method for Determination of Copper in Unalloyed Copper by Gravimetry
E 54 Test Methods for Chemical Analysis of Special Brasses and Bronzes
E 55 Practice for Sampling Wrought Nonferrous Metals and Alloys for Determination of Chemical Composition
E 62 Test Methods for Chemical Analysis of Copper and Copper Alloys (Photometric Methods)
E 75 Test Methods for Chemical Analysis of Copper-Nickel and Copper-Nickel-Zinc Alloys
E 76 Test Methods for Chemical Analysis of Nickel-Copper Alloys
E 92 Test Method for Vickers Hardness of Metallic Materials
E 101 Test Method for Spectrographic Analysis of Alu-minum and Aluminum Alloys by the Point-to-Plane Technique[0]
E 120 Test Methods for Chemical Analysis of Titanium and Titanium Alloys
E 165 Test Method for Liquid Penetrant Examination
E 227 Test Method for Optical Emission Spectrometric Analysis of Aluminum and Aluminum Alloys by the Point-to-Plane Technique
E 354 Test Methods for Chemical Analysis of High-Temperature, Electrical, Magnetic, and Other Similar Iron, Nickel, and Cobalt Alloys
E 478 Test Methods for Chemical Analysis of Copper Alloys
E 1409 Test Method for Determination of Oxygen and Nitrogen in Titanium and Titanium Alloys by the Inert Gas Fusion Technique
F 468M Specification for Nonferrous Bolts, Hex Cap Screws, and Studs for General Use (Metric)
F 606M Test Methods for Determining the Mechanical Properties of Externally and Internally Threaded Fasteners, Washers, and Rivets (Metric)
F 1470 Practice for Fastener Sampling for Specified Mechanical Properties and Performance Inspection

[1] This specification is under the jurisdiction of ASTM Committee F16 on Fasteners and is the direct responsibility of Subcommittee F16.04 on Nonferrous Fasteners . Current edition approved ~~May~~Aug. 1, 2006. Published ~~May~~August 2006. Originally approved in 1979. Last previous edition approved in ~~2005~~2006 as F 467M – 0~~5~~6.

[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Withdrawn.

***A Summary of Changes section appears at the end of this standard.**

2.2 *ASME Standards:*[4]
B 1.13M Metric Screw Threads
B 18.2.4.1M Metric Hex Nuts, Style 1

3. Ordering Information

3.1 Orders for nuts under this specification shall include the following information:
3.1.1 Quantity (numbers of pieces of each item and size);
3.1.2 Name of item;
3.1.3 Nominal thread diameter and thread pitch;
3.1.4 Alloy number (Table 1);
3.1.5 Stress relieving, if required (4.2.3);
3.1.6 "Shipment lot" testing, as required (Section 9);
3.1.7 Source inspection, if required (Section 14);
3.1.8 Certificate of compliance or test report, if required (Section 16);
3.1.9 Additional requirements, if any, to be specified on the purchase order (4.2.1, 7.2, 8.2, 11.1, and 12.1),
3.1.10 Supplementary requirements, if any; and
3.1.11 ASTM specification and year of issue.

NOTE 2—A typical ordering description is as follows: 10 000 pieces, Hex Nut, M8 × 1.25 Alloy 270, Furnish Certificate of Compliance, Supplementary Requirement S1, ASTM Specification F 467M – XX.

4. Materials and Manufacture

4.1 *Materials*:
4.1.1 The nuts shall be manufactured from material having a chemical composition conforming to the requirements in Table 1 and capable of developing the required mechanical properties for the specified alloy in the nut. See Specification B 574 for nickel alloys.
4.1.2 The starting condition of the raw material shall be at the discretion of the fastener manufacturer but shall be such that the nuts conform to all the specified requirements.
4.2 *Manufacture*:
4.2.1 *Forming*—Unless otherwise specified, the nuts shall be hot pressed, cold formed, or machined from suitable material at the option of the manufacturer.
4.2.2 *Condition*—Except as provided in 4.2.3, the nuts shall be furnished in the condition specified below:

Alloy	Condition
Copper (all alloys)	As formed or stress relieved at manufacturer's option
Nickel alloys 400 and 405	As formed or stress relieved at manufacturer's option
Nickel alloy 500	Solution annealed and aged
Aluminum alloys:	
2024-T4	Solution treated and naturally aged
6061-T6	Solution treated and artificially aged
6262-T9	Solution treated, artificially aged, and cold worked
Titanium	As formed

4.2.3 *Stress Relieving*—When required, stress relieving shall be specified by the purchaser for all copper alloys and nickel alloys 400 and 405.

5. Chemical Composition

5.1 *Chemical Composition*—The nuts shall conform to the chemical composition specified in Table 1 for the specified alloy.
5.2 *Manufacturer's Analysis*:
5.2.1 Except as provided in 5.2.2, when test reports are required on the inquiry or purchase order (3.1.8), the manufacturer shall make individual analyses of randomly selected nuts from the product to be shipped and report the results to the purchaser. Alternatively, if heat and lot identities have been maintained, the analysis of the raw material from which the nuts have been manufactured may be reported instead of product analysis.
5.2.2 For aluminum nuts, instead of 5.2.1, the manufacturer may furnish a certificate of conformance certifying compliance with the chemical composition specified in Table 1.
5.3 *Product Analysis*:
5.3.1 Product analyses may be made by the purchaser from nuts representing each lot. The chemical composition thus determined shall conform to the requirements in Table 1.
5.3.2 In the event of disagreement, a referee chemical analysis of samples from each lot shall be made in accordance with 11.1 and 12.1.

[4] Available from Global Engineering Documents, 15 Inverness Way, East Englewood, CO 80112-5704, http://global.ihs.com.

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6. Mechanical Properties

6.1 The nuts shall be tested in accordance with the mechanical testing requirements for the applicable type and shall meet the mechanical requirements in Table 2 for the specified alloy.

6.2 Where both proof load and hardness tests are performed, the proof load test results shall take precedence for acceptance purposes.

7. Dimensions

7.1 *Nuts*—Unless otherwise specified, the dimensions of nuts shall be in accordance with the requirements of ASME B18.2.4.1M.

7.2 *Threads*—Unless otherwise specified, the nuts shall have threads in accordance with ASME B1.13M, tolerance Class 6H.

8. Workmanship, Finish, and Appearance

8.1 *Workmanship*—Nuts shall have a workmanlike finish free of injurious burrs, seams, laps, irregular surfaces, and other imperfections affecting serviceability.

8.2 *Finish*—Unless otherwise specified, the nuts shall be furnished without any additive chemical or metallic finish.

9. Sampling

9.1 A lot, for the purposes of selecting test specimens, shall consist of not more than 100 000 pieces offered for inspection at one time having the following common characteristics:

9.1.1 One type of item,

9.1.2 Same alloy and temper, and

9.1.3 One nominal diameter and thread pitch.

10. Number of Tests and Retests

10.1 *Normal Testing*—The requirements of this specification shall be met in continuous mass production for stock (see Table 3). The manufacturer shall make sample inspections as specified below to ensure that the product conforms to the specified requirements. When tests of individual shipments are required, Supplementary Requirement S1 shall be specified.

Number of Pieces in lot	No. of Tests	Acceptance Criteria Acceptance No.	Rejection No.
50 and under	2	0	1
51 to 500	3	0	1
501 to 35 000	5	0	1
35 001 to 100 000	8	0	1

10.2 *Retests*:

10.2.1 When tested in accordance with the required sampling plan, a lot shall be subject to rejection if any of the test specimens fails to meet the applicable test requirements.

10.2.2 If the failure of a test specimen is due to improper preparation of the specimen or to incorrect testing technique, the specimen shall be discarded and another specimen substituted.

11. Significance of Numerical Limits

11.1 For purposes of determining compliance with the specified limits for requirements of the properties listed in this specification, an observed value or calculated value shall be rounded in accordance with Practice E 29.

12. Test Specimens

12.1 *Chemical Tests*—When required, samples for chemical analysis shall be taken in accordance with Practice E 55 by drilling, sawing, milling, turning, clipping, or such other methods capable of producing representative samples.

12.2 *Mechanical Tests* :

12.2.1 Nuts shall be proof load tested in full section.
12.2.2 The hardness shall be determined on the top or bottom face of the nut.

13. Test Methods

13.1 *Chemical Analysis*—When required, the chemical composition shall be determined by any recognized commercial test method. In the event of disagreement, the following test methods shall be used for referee purposes.

Alloy	Test Method
Copper	E 53, E 54, E 62, E 75, E 478
Aluminum	E 34, E 101, E 227
Nickel	E 38, E 76, E 354
Titanium	E 120, E 1409

13.2 *Mechanical*:
13.2.1 The proof load test shall be conducted in accordance with the appropriate methods of Test Methods F 606M. Loads to be determined using Table 2 and Table 4.
13.2.2 The hardness shall be determined in accordance with Test Methods E 18 and E 92. For nominal thread diameters M6 to M10, one reading shall be taken. For diameters M12 and larger, the hardness shall be the average of four readings located 90° to one another.

14. Inspection

14.1 When specified on the inquiry or purchase order, the product shall be subject to inspection by the purchaser at the place of manufacture prior to shipment. The inspector representing the purchaser shall have controlled entry only to those parts of the manufacturer's operations that concern the manufacture of the ordered product and only when and where work on the contract of the purchaser is being performed. The manufacturer shall afford the inspector all reasonable facilities to satisfy him that the product is being furnished in accordance with this specification. All inspections and tests shall be conducted so as not to interfere unnecessarily with the operations of the manufacturer.

15. Rejection and Rehearing

15.1 Unless otherwise specified, any rejection based on tests specified herein and made by the purchaser shall be reported to the manufacturer as soon as practical after receipt of the product by the purchaser.

16. Certification and Test Reports

16.1 *Certificate of Compliance*—When specified in the contract or purchase order, the manufacturer shall furnish certification that the product was manufactured and tested in accordance with this specification and conforms to all specified requirements.
16.2 *Test Reports*—When "Shipment Lot Testing" in accordance with Supplementary Requirement S2 is specified in the contract or purchase order, the manufacturer shall furnish a test report showing the results of the mechanical tests for each lot shipped.

17. Product, Packaging, and Package Marking

17.1 *Individual Nuts*—All products shall be marked with a symbol identifying the manufacturer. In addition, they shall be marked with the alloy/mechanical property marking specified in Table 2. The markings shall be raised or depressed at the option of the manufacturer.
17.2 *Packaging:*
17.2.1 Unless otherwise specified, packaging shall be in accordance with Practice D 3951.
17.2.2 When special packaging requirements are required by the purchaser, they shall be defined at the time of inquiry and order.
17.3 *Package Marking*—Each shipping unit shall include or be plainly marked with the following:
17.3.1 ASTM specification,
17.3.2 Alloy number,
17.3.3 Alloy/mechanical property marking,
17.3.4 Size,
17.3.5 Name and brand or trademark of the manufacturer,

17.3.6 Number of pieces,
17.3.7 Country of origin, and
17.3.8 Purchase order number.

18. Keywords

18.1 general use; nonferrous; nuts